podcast1

May 9, 2021

In [54]:
```
import os
from tqdm import tqdm
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from scipy.io import wavfile
from python_speech_features import mfcc, logfbank
import librosa
%matplotlib inline

import import_ipynb
import plotting
```

0.0.1 Collect file names and labels

In [55]:
```
wav_path = 'C://Users//richard//OneDrive//Documents//Audacity//wavfiles//'
files_path = 'C://Users//richard//OneDrive//Documents//Audacity//audio_classes.csv'
```

In [56]:
```
df = pd.read_csv(files_path)
df.head()
```

Out[56]:

	file_name	label
0	music_plus_noise1.wav	music_noise
1	music_plus_noise2.wav	music_noise
2	music_twintones1.wav	music_noise
3	music_plus_speech1.wav	music_speech
4	music1.wav	music

In [57]:
```
#df.info()
df.label.value_counts()
```

Out[57]:
```
noise              6
speech_wb_noise    6
speech_wb          6
speech_nb          6
music              5
speech_nb_noise    4
music_noise        3
```

```
music_speech       1
Name: label, dtype: int64
```

```
In [58]: df = df.set_index('file_name')
```

```
In [59]: df.head()
```

```
Out[59]:                                label
         file_name
         music_plus_noise1.wav    music_noise
         music_plus_noise2.wav    music_noise
         music_twintones1.wav     music_noise
         music_plus_speech1.wav  music_speech
         music1.wav                      music
```

0.0.2 Add some time information

```
In [60]: for f in df.index:
             rate,signal = wavfile.read(wav_path + f)
             df.at[f,'length'] = signal.shape[0]/rate
```

```
C:\Users\richard\Anaconda3\envs\tf15\lib\site-packages\scipy\io\wavfile.py:273: WavFileWarning
  WavFileWarning)
```

```
In [61]: df.head()
```

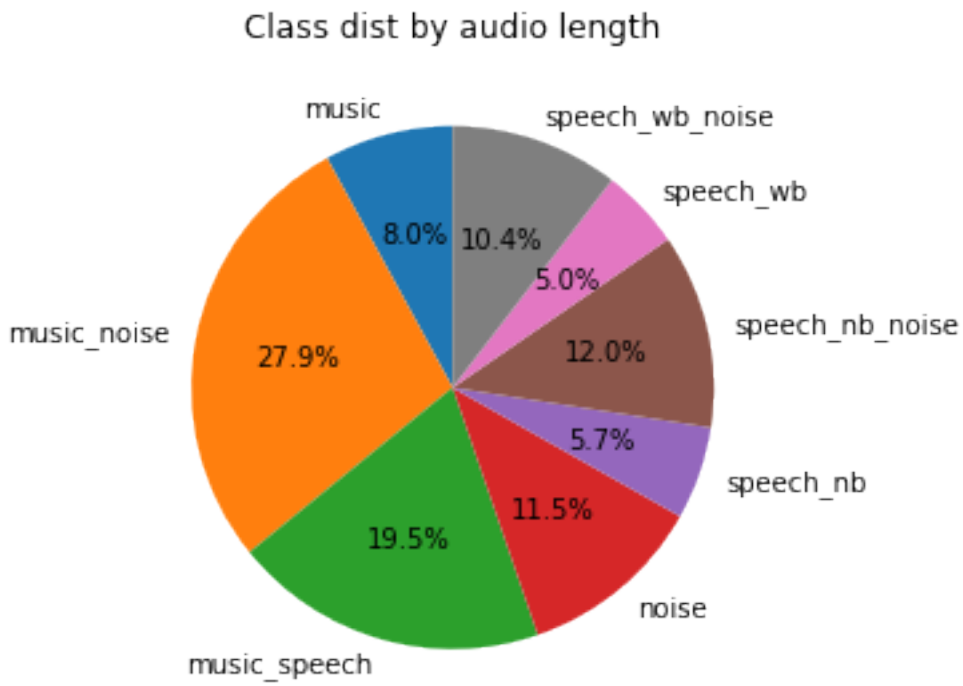
```
Out[61]:                                label    length
         file_name
         music_plus_noise1.wav    music_noise  7.543288
         music_plus_noise2.wav    music_noise  6.991315
         music_twintones1.wav     music_noise  5.944308
         music_plus_speech1.wav  music_speech  4.768209
         music1.wav                      music  2.018050
```

```
In [62]: classes = list(set(df.label.values))
         classes
```

```
Out[62]: ['music',
          'music_noise',
          'speech_wb_noise',
          'music_speech',
          'speech_nb',
          'speech_wb',
          'speech_nb_noise',
          'noise']
```

```
In [63]: #group by audio length
         class_dist = df.groupby('label')['length'].mean()
```

```
In [64]: class_dist.sort_values(ascending=False)

Out[64]: label
         music_noise        6.826304
         music_speech       4.768209
         speech_nb_noise    2.947545
         noise              2.823212
         speech_wb_noise    2.554422
         music              1.955057
         speech_nb          1.409063
         speech_wb          1.223050
         Name: length, dtype: float64

In [65]: fig,ax = plt.subplots()
         ax.set_title('Class dist by audio length',y=1.08)
         ax.pie(class_dist,labels=class_dist.index,autopct='%1.1f%%',shadow=False,startangle=90
         ax.axis('equal')
         plt.show()
```

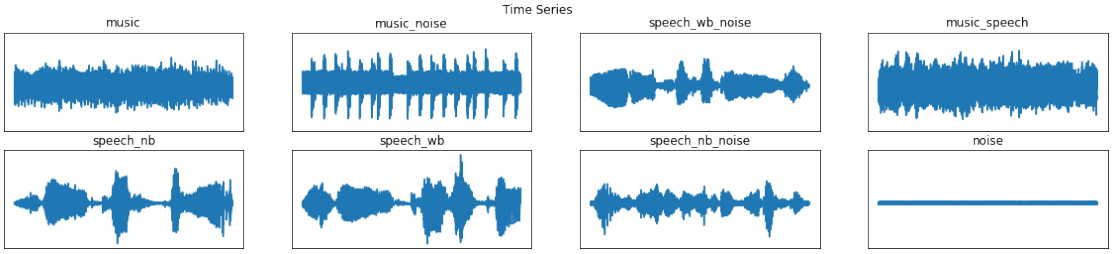



```
In [66]: len(df)

Out[66]: 37

In [67]: df.index
```

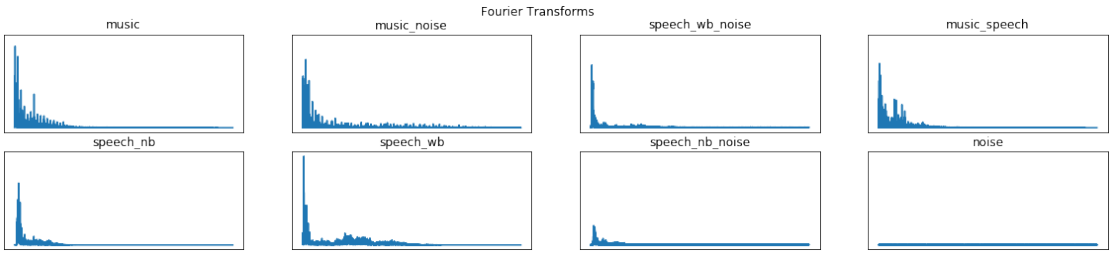
```
Out[67]: Index(['music_plus_noise1.wav', 'music_plus_noise2.wav',
                'music_twintones1.wav', 'music_plus_speech1.wav', 'music1.wav',
                'music2.wav', 'music3.wav', 'music4.wav', 'music5.wav', 'noise1.wav',
                'noise2.wav', 'noise3.wav', 'noise4.wav', 'noise5.wav', 'noise6.wav',
                'speech_nb_plus_noise1.wav', 'speech_nb_plus_noise2.wav',
                'speech_nb_plus_noise3.wav', 'speech_nb_plus_noise4.wav',
                'speech_nb1.wav', 'speech_nb2.wav', 'speech_nb3.wav', 'speech_nb4.wav',
                'speech_nb5.wav', 'speech_nb6.wav', 'speech_wb_plus_noise1.wav',
                'speech_wb_plus_noise2.wav', 'speech_wb_plus_noise3.wav',
                'speech_wb_plus_noise4.wav', 'speech_wb_plus_noise5.wav',
                'speech_wb_plus_noise6.wav', 'speech_wb1.wav', 'speech_wb2.wav',
                'speech_wb3.wav', 'speech_wb4.wav', 'speech_wb5.wav', 'speech_wb6.wav'],
               dtype='object', name='file_name')

In [68]: df.reset_index(inplace=True)

In [69]: df.index

Out[69]: RangeIndex(start=0, stop=37, step=1)
```

0.0.3 Look at frequency plots and MFCC info

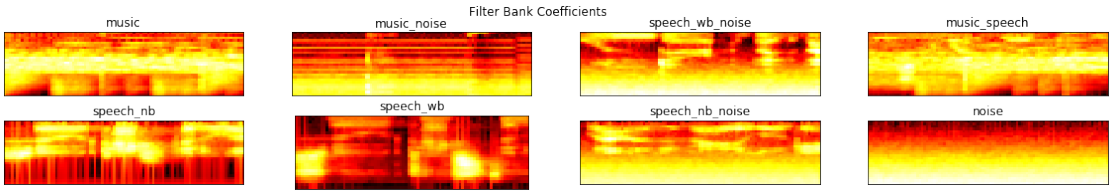
```
In [70]: def calc_fft(y,rate):
             n = len(y)
             freq = np.fft.rfftfreq(n,d=1/rate)
             Y = abs(np.fft.rfft(y)/n)
             return (Y,freq)

In [71]: #make dictionaries for each of the instrument values
         signals = {}; fft={}; fbank={}; mfccs={};

         #1s/40 = 25ms (window size)
         time_per_sec = 40;
         nfft = int(44100/time_per_sec)+1

         #get first entry for each class for display purposes
         for c in classes:
             wav_file = df[df.label==c].iloc[0,0]
             signal, rate = librosa.load(wav_path + wav_file,sr=44100 )
             signals[c] = signal
             fft[c] = calc_fft(signal,rate)
             bank = logfbank(signal[:rate],rate,nfilt=26,nfft=nfft).T     #x sec of audio, N f
             fbank[c] = bank
             mel = mfcc(signal[:rate],rate,numcep = 26, nfilt=26,nfft=nfft).T   #keep N cepstr
             mfccs[c] = mel

In [72]: #call plotting function
         plotting.plot_signals(signals)
         plt.show()
```



In [73]:
```
plotting.plot_fft(fft)
plt.show()
```



In [74]:
```
plotting.plot_fbank(fbank)
plt.show()
```



In [75]:
```
plotting.plot_mfccs(mfccs)
plt.show()
```